

Botany of some useful Plants. — Part V.

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Anonaceae.

This is chiefly a tropical order and comprises trees and shrubs several of them being aromatic. Some are climbers. The leaves are simple, alternate distichous, exstipulate and entire. The flowers are hermaphrodite or rarely unisexual and sometimes very fragrant. The calyx consists of three small valvate sepals mostly free or rarely united. There are usually six thick and fleshy petals arranged in two whorls of 3 each, the inner whorl being sometimes absent, hypogynous and valvate or vaguely imbricate. The stamens are indefinite in number arranged in many series on a thickened torus, the filament being short or absent; the anthers are two celled and adnate dehiscing by longitudinal slits; the connective is usually prolonged into a dilated hood-like structure above the anther. The pistil consists of one or more carpels mostly apocarpous very rarely syncarpous with distinct or united stigmas; the style is short or absent. Each carpel contains one or more ovules. The fruit is a berry. The seeds are provided with a ruminate endosperm.

One of the economically important genera of this family is *Anona* and this is a native of tropical America. Three species of this are cultivated in India.

Anona squamosa.—The custard apple (Tam. Seethapazham) is common throughout India and is grown in the vicinity of dwellings or in small groups in orchards. The fruits come into the market during the greater part of the year. It is a semi-deciduous small sized tree.

The leaves are alternate distichous, oblong lanceolate, obtuse to subacute, glabrous above and glaucous beneath. The flowers are axillary and borne singly or in clusters of two to four, and bracteate with minute bracts at the base of the pedicels. The sepals are free, three in number and green. The corolla consists of three valvate thick petals, triangular in transverse section and concave at the base. Sometimes an inner whorl of 3 minute petals may be present. Numerous stamens are arranged closely round the base of the enlarged torus. The ovary is apocarpous in the flower, but in the fruit the carpels are fused. The fruit is globose or heartshaped and yellowish-green with a bloom on the surface. The surface is tuberculate

and the pulp is white, custard like (hence the name) and sweet when ripe. Each carpel usually contains a brown seed.

The plants are grown chiefly for the sake of the fruits which are much appreciated. In the West Indies it is stated that a kind of drink is prepared from the fruit. The leaves, roots and fruits are used variously in medicine. An inferior fibre is obtained from the bark. The seeds contain oil and resin and the latter is useful as an insecticide.

Anona reticulata.—The 'bullock's heart' (Tam. Ram Sita) is also cultivated all over India but to a lesser extent than the former species. It is a small sized tree slightly bigger than *A. squamosa* growing to a height of 20 to 25 feet. The young branches are tomentose.

The leaves are oblong lanceolate but larger than those of *A. squamosa*, 4 inches to 6 inches long, acute and the upper surface is glabrous while the lower is sparsely hairy; a larger number of veins are present than in *A. squamosa*. The flowers are borne in small clusters on the branchlets. The sepals are small. The corolla consists of 3 outer large oblong linear fleshy petals and 3 inner small scaly ones.

In this plant the fusion of the carpels in the fruit has proceeded to a greater extent than in *A. squamosa*. It is usually heart shaped but may be oval or conical and takes a long time to mature. The surface is smooth usually reddish brown or reddish yellow and with the characteristic rhomboidal areas. Seeds are smooth and blackish.

The fruits though bigger in size than custard apple are inferior in quality and much less appreciated.

Anona muricata.—The 'sour sop' is a medium-sized tree being slightly bigger than *A. reticulata* and is less commonly cultivated. The leaves are only as big as those of *A. squamosa* two to four inches long, but are paler and more leathery; the upper surface is glabrous and the under, pubescent. The flowers occur in the axils and are very large and yellowish in colour. There are 3 small valvate sepals. The corolla is made up of six large petals in two whorls of 3 each; the outer petals are fleshy and bigger, ovate-acuminate and valvate; the inner 3 are somewhat smaller than the outer ones and are ovate, concave and overlapping. The fruit is large and provided with a number of spinulose outgrowths and is sweet when ripe.

NYMPHAEACEAE.

This is a small family, common in temperate and tropical regions all over the world and consists of perennial aquatic herbs. The stem is a submerged rhizome. The leaves are usually floating or raised above water on long petioles, sometimes large and broad, peltate, involute and the shape varies from cordate to orbicular. The flowers are solitary, large and showy, floating or raised above water and borne on elongated axillary peduncles. The calyx consists of 3 to 5 or numerous free petals. The stamens are numerous borne on a fleshy torus and generally free and hypogynous but rarely adnate to a fleshy disc enveloping the carpels. In the flower is often exhibited a gradual transition from the sepals to the petals and from the petals to the stamens. The connective is often well developed. The carpels are 3 or more in number remaining free or embedded in a fleshy disc or fused into a many-celled ovary. In the latter the styles are often united into a disc with radiating stigmas and in the case of free carpels the styles are free and short. Each carpel contains one or more ovules which are pendulous or attached to the inner surface of the carpels. The seeds are sometimes albuminous and arillate and contain perisperm.

Nelumbium speciosum.—The sacred lotus (Tam. Tamarai) is a native of tropical Asia and occurs in China, Japan, Egypt and Australia. It is commonly found in tanks all over India.

It is a large aquatic herb growing in shallow water with a well developed creeping horizontal rhizome (also termed root-stock) with adventitious roots produced from the nodes. The stem is traversed by a number of air cavities. The leaves are orbicular and concave borne on long stalks; the upper surface is dark green in colour and the lower is often light violet. The flowers are of various colours being rose, yellow or white. The flowers open at sunrise and close at sunset and is named by the Hindus as the 'friend of Sun'.

The calyx is represented by four or five free more or less petaloid sepals. The petals are free and numerous. The stamens are indefinite, free hypogynous and the connective is prolonged above the anther. The carpels are many and free and sunk in pits on the upper surface of a top shaped receptacle, lying loose in the cavities. Each carpel contains one pendulous ovule. The style is short and the stigma is terminal and peltate. The pericarp

is smooth and hard with the ovule filling up the carpel. The seeds are exendospermous with fleshy cotyledons and spongy testa.

It is held in great esteem by the Hindus and the flowers are largely used in religious observances (pujas). The root stock and the lower portions of the petioles are collected in large quantities, washed and cut into small pieces. These are then boiled with a little salt and sun dried and used later on in the preparation of soups or fried in oil and consumed. The carpels, the young torus and the young seeds are edible. The different parts of the plant are also used for medicinal purposes. The root stock is used in cases of dysentery and dyspepsia and in some fevers. The seeds form a cooling medicine for skin diseases and leprosy and are also believed to be an antidote against certain poisons. The stamens are employed in piles. The seeds are also used as beads for rosaries. The leaves take the place of plantain leaves in Indian households.

CRUCIFERAE.

It is a fairly large order being more represented in the cooler and temperate regions of the old world. Several members of this family are cultivated, some as vegetables and others for the sake of the oil contained in the seed. Most of them are herbs being rich in pungent or acrid juices. The leaves are exstipulate, radical or cauline and alternate. The inflorescence is generally terminal or axillary and racemose. The flowers are ebracteate and cruciform. There are four sepals in two series, imbricate in bud, two of them being sometimes of a larger size and saccate. The corolla is cruciform with four clawed petals in one series and imbricate. Six stamens are present arranged in two series and tetradynamous, the outer series consisting of two lateral stamens and the inner of four longer ones, 2 placed anteriorly and 2 posteriorly. There is a prominent disc made up of four glands placed opposite the sepals. There are different explanations regarding the arrangement and number of the stamens. One theory is that the two pairs of long stamens have resulted out of chorisis or division during development of originally 2 single-stamens. Another view is that the glands represent a whorl of modified stamens. The ovary is superior, 2 carpelled and usually two-celled on account of the development of a false septum connecting the two parietal placentas. The style is short or absent, with a two-lobed stigma. Many ovules are present.

The fruit is a silique dehiscing by means of two valves leaving the seeds attached to the replum. The seeds are exalbuminous but the reserve food materials in the embryo often contain oil.

In this family cross pollination is brought about by insects but self-pollination is also common.

Brassica.—This is a very important genus of the family and includes a number of economic plants. It contains about 100 species and is widely distributed in the temperate regions. The cabbages, turnips and mustards come under this genus. Most of the plants are herbs with a well developed tap root which in some cases becomes tuberous and fleshy. The leaves are large and much divided or rarely entire. The flowers develop in elongated racemes and are mostly yellow in colour. The lateral sepals are often saccate at the base. The fruits are elongated rounded or angular and provided with an indehiscent one seeded beak at the end. The valves are convex and one-to three-nerved. The stigma is truncate or two-lobed. The seeds are rounded or compressed and arranged in one series.

Brassica juncea.—The Indian Mustard (Tam. Kadugu) is cultivated throughout India and is also found run wild in many places. Several varieties exist differing in the size of the plant. In certain localities it is grown as a subordinate crop or along the borders of the fields. In other places it is often met with as a garden crop and confined to small areas. It is a tall, herbaceous erect, branching annual varying in height from 2 to 5 feet.

The stem is glaucous. The leaves are glabrous and of 2 sorts; the lower ones are very large, petiolate and pinnatifid with a terminal big lobe (lyrate) while the upper ones are smaller, sessile, lanceolate and toothed. The flowers are borne in terminal or axillary racemes and are bright yellow in colour. The fruit is a silique, slightly compressed, and about an inch in length with a slightly beaded appearance. A straight seedless beak is present. The seeds are round, small and black or dark brown in colour.

The seed is largely employed as a condiment for flavouring curries. Some people fry the seeds in oil and add it on to the food preparations while others use it in the powdered form. The seeds contain an oil. In Northern India mustard oil is largely used in cooking, for lighting and for anointing the body and more or less it takes the place of gingely oil of the South. The older leaves are given to cattle, while very young leaves are by some

used as a potherb. The seed is used for various medicinal purposes. It is externally applied in the form of a poultice to relieve inflammation and also in neuralgic and rheumatic affections. It acts as a digestive or emetic. The oil is also used in medicine.

Mention may be made of two other kinds of mustards *Brassica nigra* (black) and *Brassica alba* (white). These are very rare in South India but are cultivated in some parts of Upper India and compared to the Indian mustard, their cultivation is very limited.

Brassica nigra, the black mustard, is about 2 to 7 feet in height with a hispid stem. The lower leaves are petiolate and pinnatisect (lyrate) while the upper ones are entire. The fruits are shorter than those of Indian mustard and cylindrical with a more or less beaded appearance.

Brassica alba, the white mustard, is much allied to the others but differs from *B. nigra* in the more hairy nature of the whole plant. The leaves are all petiolate. The fruits are longer with a longer beak and are hirsute. The seeds are larger and lighter coloured. These two kinds of mustards are also used for the same purposes as the Indian mustard.

Brassica oleracea.—Under this name are included the wild cabbage and the cultivated cabbage with its different varieties. Cabbage has given rise to various fixed forms or mutants and the different parts of the shoot have been variously modified by man in cultivation to serve his needs. The different varieties could be easily distinguished only beyond a certain stage during their growth, while the seeds and the seedlings are similar. The differences are exhibited in the vegetative shoots and in the inflorescences. In Madras the cultivation of these is confined to hill stations and cooler areas.

The varieties are mostly biennial with a stout stem and not more than $2\frac{1}{2}$ feet in height. The lower leaves are large, obovate with lobed or entire margins and glaucous. The upper leaves are smaller and usually sessile. The flowers are borne on long racemes and are pale yellow in colour. The fruits are 2 to 3 inches long and project outwards. The various forms which are all included under the term 'English Vegetables' are:—

1. *B. oleracea* form *capitata*.—This is the cabbage proper. Cabbages are grown on hill stations and also in the cooler

upland districts. The stem remains short. The upper leaves and the terminal bud develop into a globose or compressed head, consisting of close set overlapping leaves. The head is developed during the first year of its growth. The lower leaves however do not take part in the formation of the head. The upper leaves are mostly crumpled.

This vegetable though grown on the hills is in great demand in most of the towns in the plains. The 'head' is cooked in a variety of ways. The lower leaves are also consumed by the poorer people. As a stock feed it is much valued. Of late the demand for cabbages is on the increase since they have been known to be rich in several kinds of vitamins.

2. *B. oleracea* form *botrytis*. Under this are included the cauliflower and the Broccoli. Just like cabbage this is also confined to hill stations. Here the axis of the inflorescence is very much shortened and the several branches and the terminal portion of the main axis become fleshy and thick. The floral parts are poorly developed. When young the whole inflorescence forms a compact whitish mass, often many inches in diameter and subtended by the lower leaves. The tender forms are known as cauliflower and the hardier ones as broccoli. The lower leaves are tied over the head in order that the edible portion may remain white and not become browned by the sun. The flower head is cooked as vegetable and is more relished than the cabbage. The lower leaves which resemble those of the cabbage are used for food by the poorer people.

3. *B. oleracea* form *gemmifera*. This is the Brussels sprout. In this an erect elongated stem is present. From the main axis numerous axillary branches develop but these instead of spreading or branching out become rounded and compact resembling miniature cabbages. These buds are 1—2 inches in diameter and the leaves enclosing them are much crumpled.

In South India this is found exclusively on hill stations. It is more tender than the cabbage but is cooked like cabbage. Sometimes soups are made by using whole buds without slicing them.

4. *B. oleracea* form *gongylodes* or *caulorapa*. This is commonly known as knolkhol or kohlrabi or sometimes as 'turnip-rooted cabbage.' The plants in this form remain short. The

portion of the stem above the cotyledons is short and becomes much swollen and fleshy. On this are borne several petiolate leaves and the scars of the leaves are left on the swollen stem. Different forms exist varying in the colour and shape of the plants, purple and white stemmed types being the principal ones. This is able to resist drought better than the other varieties.

It is also grown on the hills but can be cultivated on the plains in some districts especially during the cold weather. The swollen stem is sliced and used in the preparation of soups or curries. As a stock feed it is valuable.

Brassica campestris.—Under this name are included the turnips, the rape, and the swedish turnips. These are described by some as varieties of *B. campestris*. The Swedish turnip is named as *B. campestris* proper, the common turnip as *B. campestris* var. *rapa* and the rape as *B. campestris* var. *napus*. But recently these three have been described as separate species, the varietal names being used to distinguish the species.

Bassica rapa. The common turnip included under the term 'English vegetable' is cultivated in South India on the hills or during the cold season in some districts in the plains. There are several varieties differing in the shape and the colour of the flesh of the roots.

It is a herbaceous biennial. During the first year a swollen tuberous fleshy tap root develops. The 'turnip' of the market consists of the swollen tap root and the enlarged hypocotyl. A rosette of leaves develops from the top of this during the first season. These leaves are large, pinnatifid and hairy. During the second season a central branched stem develops. On this are borne smaller entire or slightly toothed smooth and glaucous leaves. The stem and its branches terminate in clusters of flowers. The inflorescence is at first corymbose but later the axis elongates becoming a raceme. The flowers are bright yellow in colour and the petals are shed before the corymb elongates. The silique is $1\frac{1}{2}$ to 2 inches long and has a short beak. The seeds are reddish brown and round.

The tuberous roots are cooked and used as vegetable. Some varieties are coarse while others are fine. The finer varieties are used as food by man while the coarser ones are used as stock-feed.

Brassica campestris.—The swedish turnip resembles closely the common turnip. This also possesses a turberous swollen root but a short stem or neck is present on the upper part of the swollen structure. The leaves are glaucous; the lower ones are large petiolate, lyrate and hispid while the upper ones are smaller and glabrous. The flowers are yellow and larger than those of *B. rapa* and the petals remain attached till the corymb elongates. The siliques are 2 to 3 inches long and the seeds are larger than those of the common turnip.

The swollen roots are used for the same purposes as the common turnip. The flesh is said to be firmer and more nutritious.

Brassica napus. The rape or coleseed of which there are different varieties is largely cultivated in Northern India. It is a biennial growing to height of 2 to 3 feet. There is no swollen root but sometimes a fusiform root may be present. The stem is much branched. The lower leaves are lyrate while the upper ones are entire; all the leaves are glaucous and glabrous. The lowers are yellow and the petals fall off before the corymb elongates. The seeds are dark purple in colour.

The young plants at the end of the first season are cut and given to sheep. The seed contains an oil which is extracted and largely used in Upper India for cooking and lighting purposes. The oil is inferior to mustard oil. The oil cake is sometimes used as stock-feed.

Raphanus sativus. The radish (Tam. Mullangi) is grown extensively all over India as a vegetable in kitchen gardens, both on the plains and on hill stations. Many varieties are present.

It is a herbaceous biennial but since the plant is grown for the sake of the root, it is removed during the first year of its growth. Those which are kept for seed purposes are of course left over and the seed is gathered in the second year.

The tap root is swollen and fleshy, more or less conical and whitish in colour with 2 rows of lateral roots. The stem is very much condensed and from the crown of the swollen portion (made up of the root and the hypocotyl) a rosette of leaves (radical) springs up during the first year. The leaves are large, petiolate, and pinnatifid (lyrate). During the second year a central shoot elongates with a number of smaller, oblong leaves and terminates in elongated racemes. The flowers are large and usually white,

and of the mustard type. The sepals are erect and the lateral ones are saccate at the base. The fruits are about 2 inches long, slightly beaked in appearance, with a long tapering beak and with 2 or 3 seeds which are surrounded by pithy tissue. The seeds are yellow and globose.

The cotyledons are epigeal and persist as green leaf-like structures for a long time.

The root is the important part of the plant and is made use of as vegetable in various ways. It develops a peculiar flavour and is not liked by some people. The leaves are sometimes used as pot-herb by poorer classes and as fodder for cattle. The roots leaves and seeds have various medicinal properties.